United States Patent

Fisher

[15] **3,681,565**

[45] **Aug. 1, 1972**

[54] **SUSPENDED STAGING INCORPORATING AUTOMATIC WELDING EQUIPMENT**

[72] Inventor: **Sidney L. Fisher,** 9203 Mount View Dr., Renton, Wash. 98055

[22] Filed: **Sept. 29, 1969**

[21] Appl. No.: **861,757**

[52] **U.S. Cl.** **219/126,** 182/142, 228/45

[51] **Int. Cl.** **B23k 9/12**

[58] **Field of Search**.....219/124, 125, 126, 60; 182/142, 143; 228/45

[56] **References Cited**

UNITED STATES PATENTS

3,296,412	1/1967	Waite et al.	219/126
3,466,421	9/1969	Beltor et al.	219/126
3,518,397	6/1970	Hannahs	219/126 X
2,794,901	6/1957	Christensen et al.	219/126
2,866,078	12/1958	Ballentine, Jr. et al.	219/126
3,134,014	5/1964	Shupp	219/126
3,220,509	11/1965	Fisher	182/142
3,382,344	5/1968	Hasegawa et al.	219/126
3,419,700	12/1968	Tanigaki et al.	219/126
3,455,495	7/1969	Vest	219/126 X

OTHER PUBLICATIONS

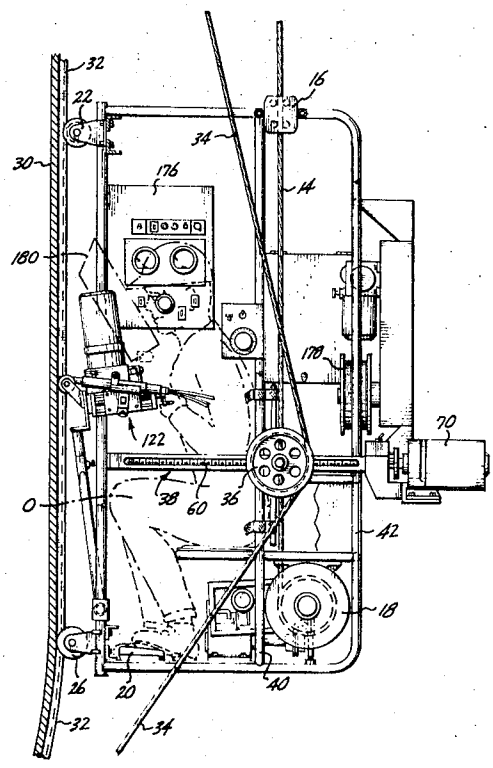
Arcos-Vertomatic Welding Equipment, Arcos Corporation, July 1967

Primary Examiner—J. V. Truhe
Assistant Examiner—L. A. Schutzman
Attorney—Graybeal, Cole & Barnard

[57] **ABSTRACT**

A welding torch is mounted at the upper end of a generally vertical swing arm. The lower end of such arm is pivotally connected to a lower frame portion of a single cable suspended staging. One or more tensioned hold-in lines hold the staging inwardly against the object on which welding work is being done. Each hold-in line rides on a sheave which is automatically controlled to move either towards or away from the object for the purpose of maintaining proper tension in the hold-in line. The swing arm is resiliently urged towards the object by an adjustable torsion spring mechanism. Cooling water for the welding torch is circulated through frame members of the staging, whereby such members function as both structural members and heat dissipating radiator members.

10 Claims, 10 Drawing Figures



PATENTED AUG 1 1972

3,681,565

SHEET 1 OF 3

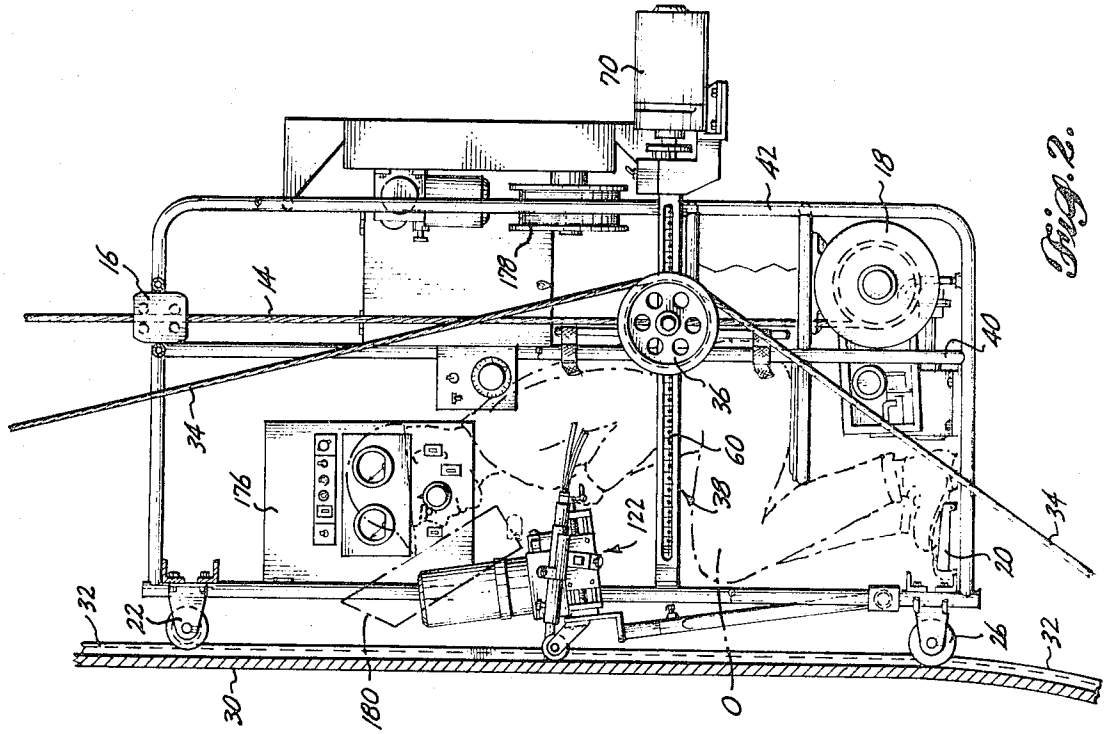


Fig. 2.

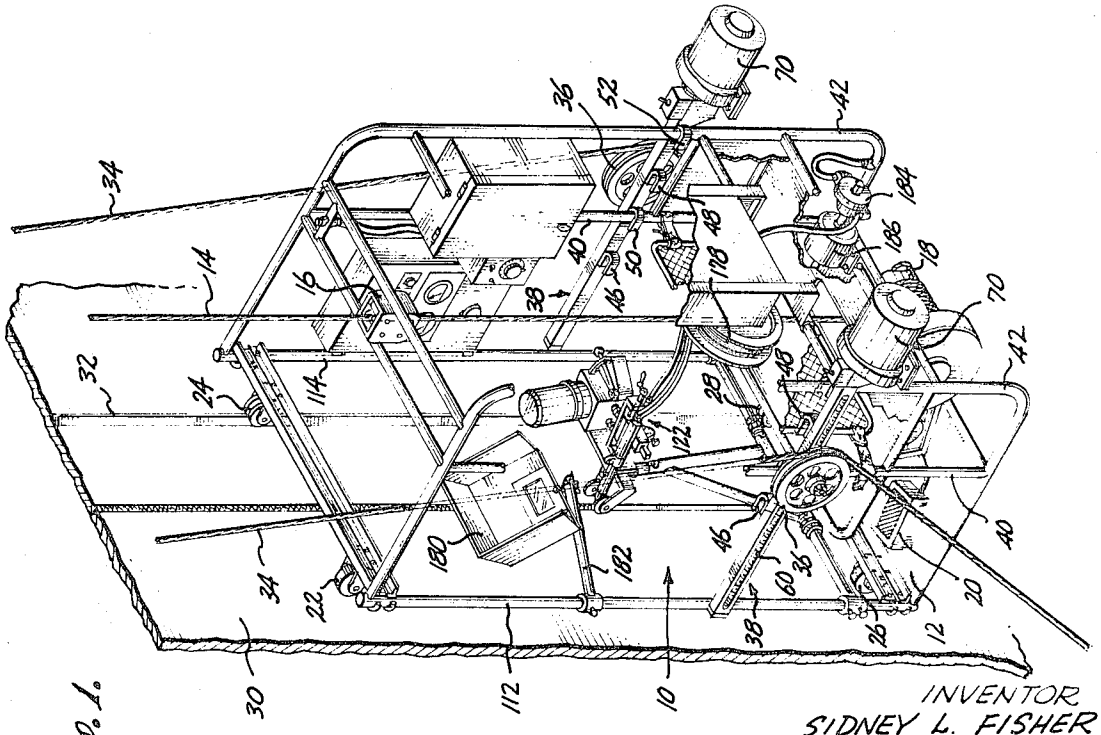


Fig. 1.

INVENTOR
SIDNEY L. FISHER
BY Strauch, Cole & Barnard
ATTORNEYS

Fig. 3.

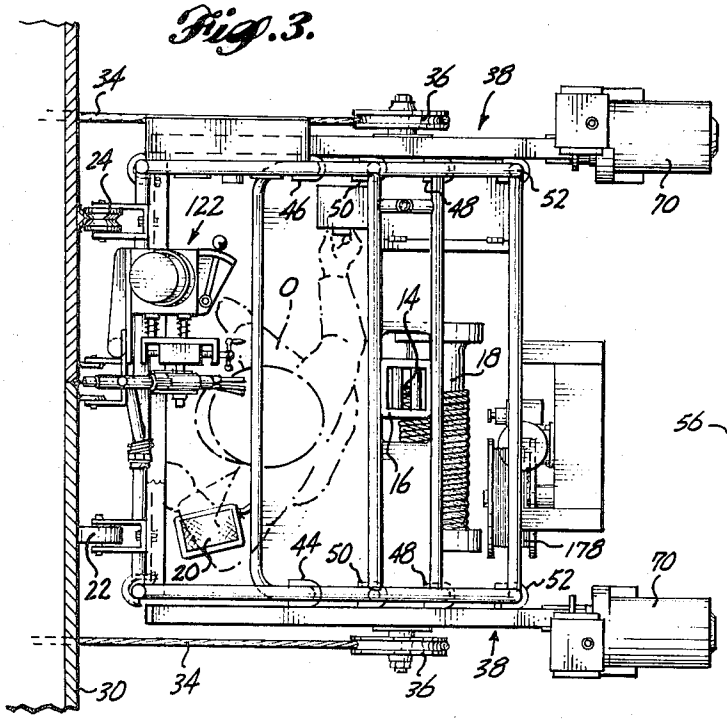
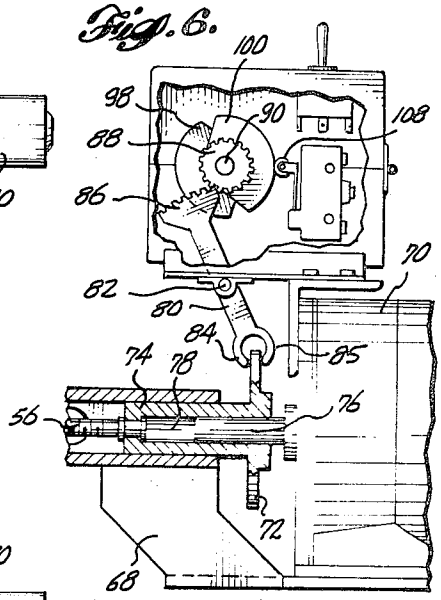


Fig. 6.



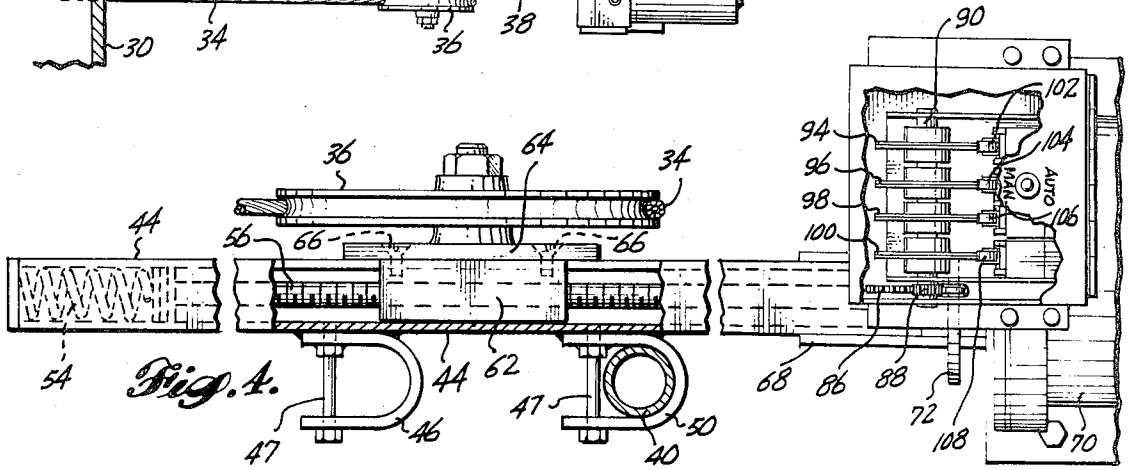


Fig. 4.

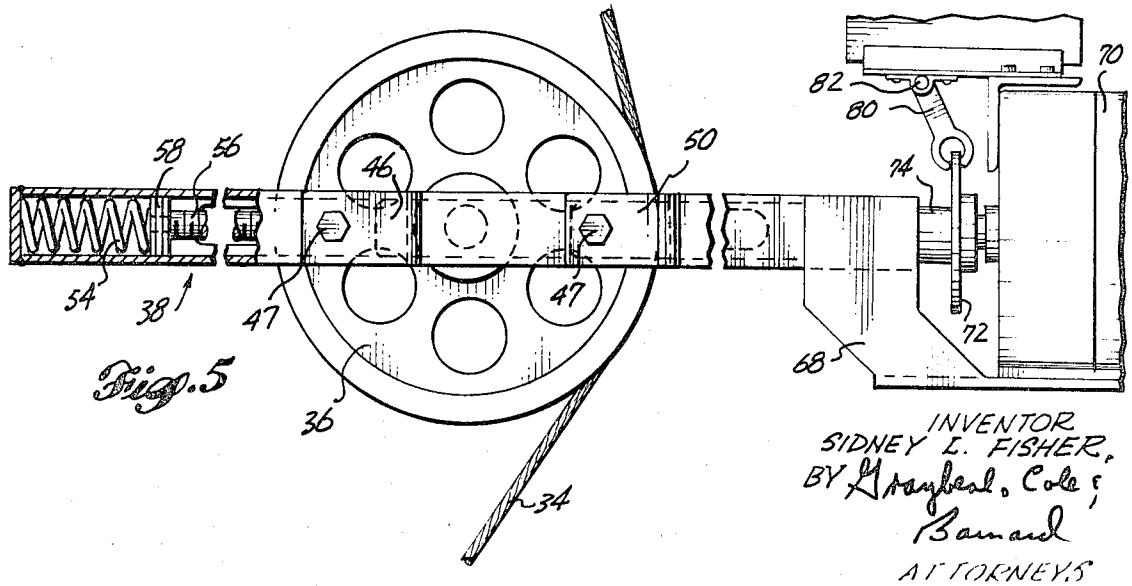


Fig. 5

INVENTOR
SIDNEY L. FISHER.
BY Krayberal, Cole & Barnard
ATTORNEYS

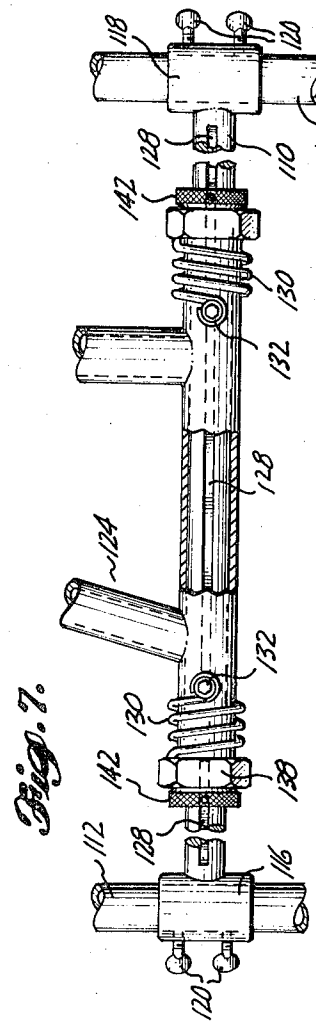


Fig. 7.

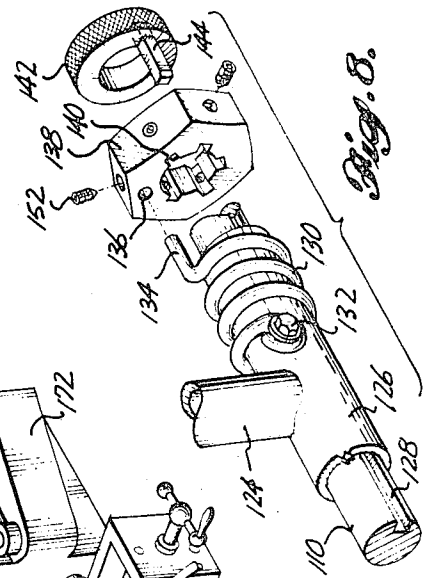


Fig. 8.

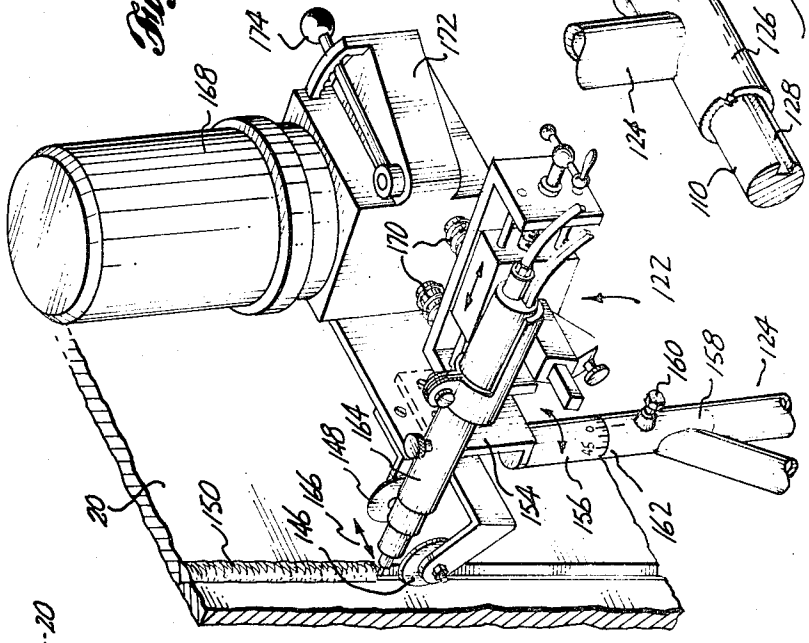


Fig. 9.

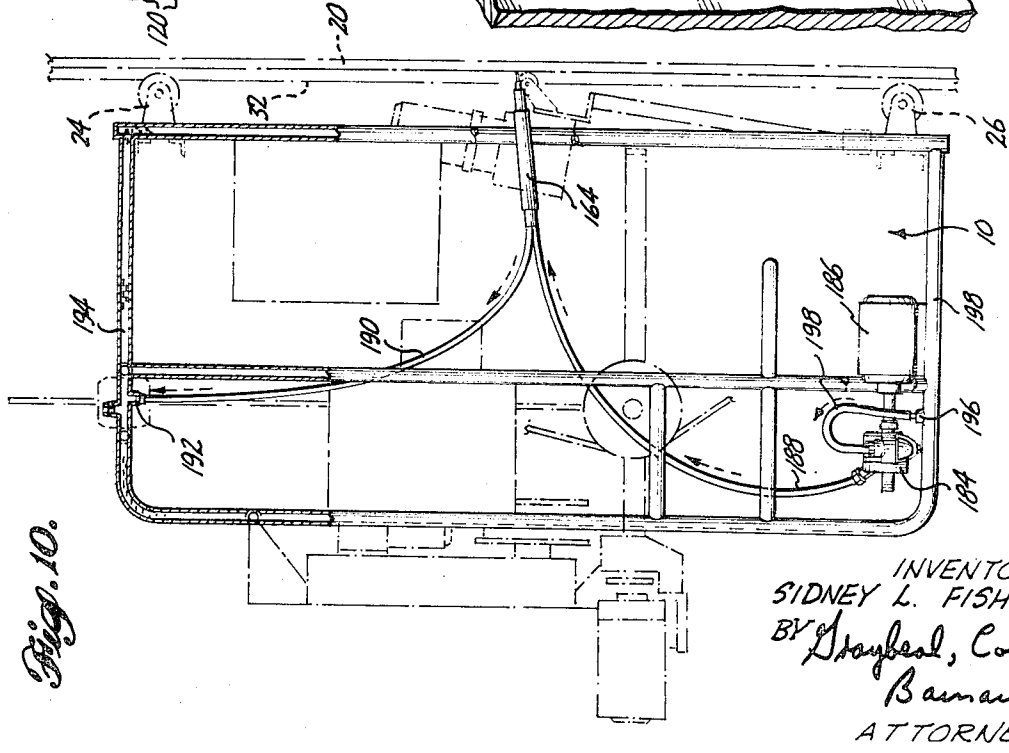


Fig. 10.

INVENTOR
SIDNEY L. FISHER
BY Drayford, Cole & Barnard
ATTORNEYS

SUSPENDED STAGING INCORPORATING AUTOMATIC WELDING EQUIPMENT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to automatic welding equipment, and more particularly to an improved welding machine for welding elongated vertical straight or curved seams.

2. Description of the Prior Art

In ship building, large tank construction, etc., vertical walls or barriers are formed by welding together a plurality of large plate steel panels. Automatic welding machines are generally used for performing this work. They comprise a welding torch and means for moving the torch at the proper rate of travel along, and at the proper spacing from, the seam being welded.

Harmsen et al, U.S. Pat. No. 3,303,321 shows one type of known equipment for welding vertical seams. It is characterized by an elaborate track structure **14** which is secured to a part of the object on which welding is being done and in which the mechanism for moving the welding equipment is incorporated. A disadvantage of this type of equipment is that it does not lend itself to use with both straight and curved surfaces, and it does not involve an operator's station adjacent the welding equipment. Even in automatic welding operations it is necessary to have an operator present to make necessary adjustments and to inspect the work as it is being done.

Christensen et al, U.S. Pat. No. 2,794,901 disclose another type of automatic vertical seam welding machine involving a plurality of vertical post members along which the welding equipment travels up and down. A platform is provided on each side of the wall being formed and each platform includes a counterweight for biasing it inwardly toward the wall panels being welded. This type of equipment is quite expensive, is cumbersome to operate, is not suitable for use with vertically curved panels, and is not adaptable for use in welding relatively long vertical seams.

SUMMARY OF THE INVENTION

The present invention relates to a suspended staging type automatic welding machine for use in welding vertical seams. In my prior U.S. Pat. No. 3,220,509, granted Nov. 30, 1965, I disclose a suspended staging which is adaptable for use in welding vertical seams. Some of the features of the present invention may be incorporated in the staging disclosed in my U.S. Pat. No. 3,220,509. Other features of the present invention involve improvements in such staging equipment.

The present invention includes the provision of automatic welding equipment in a suspended staging and particular arrangements of such equipment relative to an operator's station in the staging.

The welding equipment, i.e., the torch, rod holder, controls, etc. is supported on or carried by the staging. The mounting means for the welding torch takes up little room and quite effectively supports the welding torch relative to both the staging and the work object. The rate of climb of the staging is regulated to correspond to the rate of travel requirements of the welding torch.

One aspect of the present invention is to provide a particular spring system for biasing the torch holding arm against the plates being welded.

Another feature of the invention involves interconnecting at least some of the tubular frame members of the staging and circulating the cooling water for the welding tool through them, whereby such members function as radiators for dissipating heat from the coolant to the surrounding ambient air as well as structural members for the staging.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is an isometric view taken from above and towards the rear and one side of a suspended staging type vertical seam welding machine constructed in accordance with the present invention, with foreground portions of the machine being cut away for the purpose of exposing other portions of the machine in the background of the view;

FIG. **2** is a side elevational view of the welding machine, including a phantom line showing of an operator and his face protection shield;

FIG. **3** is a top plan view of the welding machine, also including a phantom line showing of the operator;

FIG. **4** is a top plan view of one of the hold-in cable tensioning mechanisms, with some outer parts broken away for clarity of illustration of certain inner parts, with a constant section intermediate portion of the mechanism being segmented, and with certain end portions of the mechanism not essential to the showing being omitted;

FIG. **5** is a side elevational view of the mechanism of FIG. **4**, which in similar fashion is also segmented and broken away in parts;

FIG. **6** is a fragmentary side elevational view of the control cam end of the hold-in mechanism;

FIG. **7** is a fragmentary view of the base portion of the welding tool support standard;

FIG. **8** is an exploded fragmentary isometric view of one of the adjustable biasing spring assemblies;

FIG. **9** is a fragmentary view of a typical welding head assembly, shown in the process of being used for welding a vertical seam; and

FIG. **10** is a side elevational view of the machine taken from the side opposite the side shown by FIG. **2**, showing the various components of the cooling system for the welding head, including the radiator composed of tubular frame portions of the machine, with certain components not essential to this feature of the invention being omitted and others being depicted by broken lines for purposes of reference.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring more specifically to the several figures of the drawing, the suspended staging is shown to comprise a forwardly disposed operator compartment or cage **10** having a floor or deck **12**. A suspension line **14** extends from an anchored position above (not shown) downwardly through a fairlead **16** to a power-driven winch drum **18** onto and off from which line **14** is wound. In a single suspension cable staging of the type shown safety and reliability of operation are extremely important. In this respect it is vital that the suspension line **14** spool onto the winch drum **18** compactly and levelly, that the take-up and let-out of the suspension line **14** progress evenly, and that no undue wear of the suspension line **14** occurs. So that these conditions will exist, the winch mechanism is preferably of the level-

winding type disclosed and claimed in my prior U.S. Pat. No. 2,998,094. The contents of such U.S. Pat. No. 2,998,094 and the contents of my aforementioned U.S. Pat. No. 3,303,321 are hereby incorporated herein by this specific reference.

The winch drum **18** is preferably driven by a variable speed, reversible electric motor mounted in the lower portion of compartment **14** closely adjacent the winch drum **18** and suitably connected thereto by gear reduction means. The control circuit for the electric drive motor includes a suitable switch mechanism operable to control the direction of rotation of the reversible motor. Preferably, a rheostat is provided in series between the switch mechanism and the motor and is used for varying the rotational speed of the motor and the winch drum so as to in turn vary the rate of up or down travel of the staging. The rheostat may be adjusted so as to coordinate the rate of upward movement of the staging with the speed at which the welding operation can be performed.

In the illustrated embodiment a foot operated off-on switch **20** is provided for controlling the electric motor and hence the starting and the stopping of vertical travel. Reference is made to the aforementioned U.S. Pat. Nos. 2,998,094, and 3,303,321 for a more detailed discussion of the staging drive and level winding equipment and its manner of operation.

Upper and lower pairs of wheels **22, 24** and **26, 28** are supported at the front of the machine. Wheels **22, 26** are shown to directly contact the vertical wall **30** being traversed by the welding machine. Wheels **24, 28** have grooved peripheries and they follow along a vertical guide track **32** which is suitably secured to the wall **30**. The welding machine must be accurately guided during its vertical travel while welding and the grooved wheels **24, 28** and the track **32** serve as simple and effective apparatus for forming the guiding or tracking function. The track, shown to be made from standard angle iron, can be bent and made to follow a vertically curved surface in installations requiring welding along a vertically curved path. Of course, it is to be understood that the welding machine can be guided for travel along a straight line path by various other types of apparatus as well and that the particular guiding apparatus disclosed is presented merely by way of example.

It is also important for the welding machine to be maintained close against the vertical wall **30**. For this purpose a pair of hold-in cables **34, 36** are provided, one laterally outwardly on each side of the staging. The cables **34, 36** are suitably anchored at their upper and lower ends and they each ride rearwardly of a freely rotatably sheave **38** and ride in a peripheral groove thereof. The sheaves **38** are supported by mechanism which is adapted to automatically shift the sheaves **38** in position normal to the wall **30**, for the purpose of maintaining ample tension in the hold-in lines **34, 36**.

As best shown by FIGS. **3–5**, each sheave assembly **38** is individually securable to a frame portion of the staging on its side of the staging. The particular staging illustrated comprises a pair of rearwardly stationed vertical frame posts **40, 42** on each side of the staging. Each sheave positioning mechanism **38** includes an elongated lead screw housing **40** and two separately usable pairs of mounting brackets **42, 44** and **46, 48**. The mounting brackets are shown in the form of U-shaped pieces of metal having one leg thereof welded to the back wall of the lead screw housing **40**. The spacing of the clamps **42, 44, 46, 48** along the lead screw housing is such that the inner bight areas of each pair of brackets **42, 44** and **46, 48** are spaced apart a distance equal to the spacing of the vertical frame posts **40, 42**. Machine bolts **53** may be used to clamp the brackets **46, 50** to the posts **40, 42**.

Referring now to FIGS. **4** and **5**, a compression spring **54** is located in the housing **44** near the end thereof closest to the wall **30**. A lead screw **56** is located inside of housing **38** and it includes a head **58** which rests against the compression spring **54**. As best shown by FIGS. **1** and **2** the outer side of the lead screw housing **44** includes a longitudinal slot **60**. An elongated sheave support block **62** is located with in the housing **44**. It includes a longitudinal bore threaded with internal threads which match the external threads of the lead screw **56**. Block **62** is transversely dimensioned to be slightly smaller in size than the transverse dimensions of the hollow interior of the lead screw housing **44**. A plate **64** located outwardly of housing **44** is secured to the block **62**, such as by countersunk metal screws **66** or the like, and the sheave **36** is rotatably mounted on the plate **64**. As can be readily seen, rotation of the lead screw **56** causes movement of the block **62** in one direction or the other longitudinally along the lead screw **56**, resulting in a longitudinal travel of the sheave **36** relative to the lead screw housing **44**.

A motor mounting bracket **68** is connected to, and depends downwardly below and then endwise outwardly from, the end portion of lead screw housing **44** distal the wall **30**. It mounts an electric motor **70** which serves to rotate the lead screw **56**. The end of the lead screw **56** distal the spring **54** is connected to a circular plate **72** in such a fashion that the plate both rotates and moves axially with the lead screw **56**. As shown by FIG. **6**, the lead screw **56** is secured to the inner end of a tubular hub **74** on which the plate **72** is mounted. The output shaft **76** of the motor **70** is noncircular in cross section and it is snugly received within a blind socket **76** formed axially through hub **74** and having the same cross-sectional shape as shaft **76**. The noncircular cross-sectional shapes of the shaft **76** in the socket **68** establish a rotary drive connection between the shaft **76** and the hub **74**. The fit of shaft **76** within socket **78** is loose enough so that the hub **74** is free to slide longitudinally of the shaft **76**.

The motor **70** is a reversible motor and it is provided with both manual and automatic control means. The manual control means is primarily used when it is desirable to slacken the hold-in lines **34** for the purpose of dismantling the equipment, or to initially tension the lines **34**.

The automatic control mechanism includes a control arm **80** which is pivotally mounted at a point intermediate its ends for swinging movement in a plane perpendicular to the plane of the plate **72**, such as by a pivot pin **82**. As shown by FIG. **6**, the lower end of arm **80** is bifurcated and places an arcuate finger **84, 85** on each side of the plate **72**. The fingers **84, 85** are inwardly concave to provide clearance for the peripheral portion of the plate **72** during each stage of relative

movement. The opposite or upper end 86 of arm 80 carries an arcuate segment 86 of a gear which meshes with a drive gear 88 at one end of an elongated cam shaft 90 which turns on an axis parallel to the axis of pivot pin 82. A plurality of switch operating cams 94, 96, 98, 100 are spaced apart along the shaft 90. Each cam 94, 96, 98, 100 includes a mounting hub portion and a plate portion which is a sector of a circular plate. Set screws extending through the hubs are provided for securing the cams 94, 96, 98, 100 in set positions relative to the shaft 90. The plate portions of the cams 94, 96, 98, 100 are positioned to each contact and close a related switch lever 102, 104, 106, 108 during a particular rotational phase of the cam shaft 90.

The spring 54 is a calibrated spring and stores a predetermined amount of energy, i.e., 600 pounds. Let it be assumed that the various components are in the position depicted by FIG. 5, the tensioning mechanism is on automatic, and there is insufficient tension in a hold-in cable 34. Under such conditions the stored energy in spring 54 would push the lead screw 56 to the right, as pictured. The lead screw 56 would carry with it the cam positioning plate 72. Through arm 80, segment gear 86, gear 88 and shaft 90 the plate 72 would position one of the cams (e.g. cam 100) into contact with the switch lever 108 of the related switch, closing such switch and causing rotation of the motor 64 in the direction causing lead screw 56 to rotate in the direction to block 72 and the sheave 36 carried thereby to be moved rearwardly from the wall 30 and against the hold-in line 34, bending it outwardly and increasing its tension. Once the tension in line 34 reaches a desired amount further outward travel of the sheave 36 is arrested and the lead screw 56 begins to move longitudinally inwardly towards wall 30, compressing spring 54. Lead screw 56 carries plate 72 with it as it so moves. This plate movement causes a clockwise rotation of arm 80 and a counterclockwise rotation of the gear 88, the shaft 90 and the cam members 94, 96, 98, 100 carried thereby. Once the cable 34 is sufficiently tensioned one of the other cams (e.g. 98) operates its switch lever 106 to open the motor control circuit. Switches 102 and 104 are in the manual circuit and are limit switches to control the maximum allowable inward and outward movement of the sheave 36 during manual operation.

The tension control mechanisms for the two hold-in lines 34 operate independently of each other. This is important since an irregular wall shape or some other factor might cause a different set of conditions effecting hold-in line tension on one side of the staging from those existing on the other side of the staging.

Referring now to FIGS. 1, 7 and 9, a horizontal support bar 110 extends between and at its ends is connected to lower portions of the front frame posts 112, 114. In FIG. 7 bar 110 is shown to be connected to mounting sleeves 116, 118 at its opposite ends. Sleeve 116 surrounds post 112 and sleeve 118 surrounds post 114. One or more set screws 120 are provided through wall portions of the sleeves 116, 118, and serve as means for locking the sleeves 116, 118, and hence the support bar 110, in position relative to the post 112, 114.

The welding mechanism, hereinafter to be described in greater detail, includes a welding torch assembly 122 mounted at the upper end of a support standard 124, which is also termable a swing arm or swing arm assembly. Standard 124 includes a mounting sleeve 126 at its lower end which surroundingly engages the horizontal support bar 110, so as to be rotatable thereabout. The support bar 110 is formed to include a longitudinal key slot 128. A coil type torsion spring 130 is provided at each end of sleeve 126. The torsion springs 130 each surround an end portion of sleeve 126 and each has its inner end secured to the sleeve 126, such as by a securement pin 132. The outer ends of the springs 130 extend axially of the support bar 110 and are insertable into an opening 136 formed axially through an adjustment nut 138 which surrounds the support bar 110 outwardly of its end of sleeve 126. The inner wall of each nut 138 is formed to include a plurality of key slots 140 which are positionable radially outwardly of the key slot 126 in bar 110. A key element carrying ring 142 is located on bar 110 outwardly of each adjustment nut 138. Each ring 142 carries an axially extending key element 144 which is snugly receivable in the key slots 128, 140. The depth or radial dimension of the key element 144 is of a depth substantially equal to the combined depths of the slot 128 and a related slot 140.

The welding torch assembly includes a pair of laterally spaced apart guide wheels 146, 148, located on opposite sides of the weld line 150. It is important that throughout the welding operation these wheels 146, 150 remain in contact with the wall 20. The torsion springs 130 serve to resiliently bias the support standard 124 towards the wall 20, and in that manner maintain the contact of the wheels 146, 148 with wall 20.

Tensioning of the springs 130 involves the following procedure. The outer end portion 134 of each spring 130 is placed within the hole 136 for it in the related adjustment nut 138. Next the operator uses a wrench to rotate the nut 138 in the direction placing energy in the spring 130 for biasing the standard 124 toward wall 20. During the turning operation of each nut 138 the related cam ring 142 is slid endwise outwardly along support bar 110 to place its cam element 144 out of the way of nut rotational movement. Once sufficient energy is in a spring 130 the operator moves the nut 138 by means of the wrench into a position placing the nearest slot 140 in alignment with the slot 128. Then the ring 142 is moved endwise along shaft 110 to place key element 144 into engagement with the selected slot 140 in the nut 138 as well as with the slot 128 in bar 110. Preferably a set screw 152 is provided in nut 138 in association with each key slot 140. The set screws 152 are provided as a means for locking the key element 144 in position relative to the nut 138.

The welding torch assembly 122 is merely one of several commercially available pieces of automatic welding equipment which can be adapted for use in the welding machine of the present invention. Such assembly is shown to include a frame 154 which is mounted atop a support shaft 156. The lower end of the support shaft 156 extends downwardly into the upper end portion of the main tubular member 158 of swing arm assembly 124. A set screw 160 extends through a side wall portion of tube 158 and is used to secure the shaft 156 and the frame carried thereby in a predeter-

mined position relative to the swing arm assembly **124**. Angular gauge marks **162** may be provided on the external surfaces of post **156** in tube **158** where they meet.

The welding tool **164** is supported by adjustable mounting mechanism which provides for attitude adjustment of the tool **164** in essentially all directions. This equipment will not be described here because of its conventional nature. The mounting mechanism for the tool **160** also includes an adjustable power driven mechanism for moving or sweeping the welding torch tip sideways back-and-forth along the direction of arrow **166**. This apparatus is shown to include a motor **168**, reciprocating drive rods **178** for moving the welding tool **164**, and an adjustable transmission **172** including a control lever **174** for changing the width of the tip stroke.

The welding equipment is shown to also include a control panel **176** located to one side of the operator O, within his easy reach, and a spool of welding rod wire **178** positioned rearwardly of the operator O. Also, a protective face mask **180** is mounted on front vertical post **112** by means of an adjustable support arm **182**. Arm **182** is adjustable up-and-down and angularly around post **112** and the mask **180** is adjustably connected to the outer end of arm **182** by means of a universal joint.

The welding torch **164** is cooled by a refrigerant (e.g. water) which is delivered in a relatively cold condition into coolant passages within the torch **164**. It is circulated about or adjacent the parts to be cooled. It is then removed from the torch **164** in a hot condition and is delivered to a radiator or some other device for removing the heat from it.

In FIG. **10** the cooling system is shown to comprise a pump **184** driven by an electric motor **186**. Both the pump **184** and the motor **186** are mounted on the floor of the staging, generally rearwardly of the operator station **10**. The discharge end of the pump **184** is connected to the cooling fluid inlet of the tool **164** by means of a hose **188**. A second hose **190** delivers the heated coolant from the tool **164** into a radiator composed of at least some of the tubular frame members of the caging. By way of typical and therefore nonlimitive example, in the illustrated embodiment the hose **190** is shown connected to an inlet **192** provided in an upper horizontal tubular frame member **194**. In this embodiment all of the tubular frame members are interiorly interconnected so that the entire staging serves as a radiator. An outlet **196** is provided in the lower horizontal member **198**, and a hose **198** extends from the outlet **196** to the inlet of the pump **184**. In operation, the coolant is pumped to and then through the welding tool **164**. The heated coolant then travels through holes **190** into the radiator, i.e., into the interiors of the several tubular members **40, 42, 112, 114, 194, 196**, etc. of the staging, and then from the radiator back into the pump **184**. As will be apparent, the coolant is cooled by ambient air while it flows through the passageways of the radiator. Collectively the frame members expose a substantial surface area to the ambient air, resulting in the frame serving as an effective radiator. If additional cooling of the coolant is necessary, an additional heat exchanger or other cooler can be incorporated into the coolant circuit.

What is claimed is:

1. A suspended staging comprising deck and frame means forming a compartment for a workman, said frame means including a transverse support bar at the lower forward portion of the staging;

means for guiding said staging along a generally vertical path adjacent a generally vertical object; and

welding equipment on said staging including a welding tool support in the form of a swing arm assembly having a sleeve at its lower end which surroundingly engages said transverse support bar and pivotally mounts said support arm on said support bar, and an upper free end portion for mounting a welding tool, an automatic welding tool mounted on said upper end portion of the swing arm assembly and facing said generally vertical object, guide means on said support adjacent said welding tool contacting the staging side of said generally vertical object, and means interconnected between said staging and said swing arm assembly for resiliently urging said swing arm assembly toward the generally vertical object, so as to maintain said guide means in contact with such object and the welding tool properly spaced therefrom, said means including torsion spring means interconnected between the support and said sleeve.

2. A suspended staging according to claim **1**, also comprising adjustable connector means between said welding tool and said swing arm assembly permitting rotational adjustment of said welding tool about the longitudinal axis of said swing arm assembly.

3. A suspended staging according to claim **1**, wherein said welding tool includes holder means for holding welding wire and feeding it to the welding site, and means for sweeping said holder means and the welding wire carried thereby back-and-forth along a lateral path.

4. A suspended staging according to claim **1**, wherein said torsion spring means includes an adjustment member surrounding and rotatable about said support bar, and a coil spring having one of its ends secured to the adjustment member and its other end secured to said sleeve, and means for holding said adjustment member fixed relative to said support bar following rotation of such member in a direction placing stored energy in said spring for biasing the arm assembly towards the generally vertical object.

5. A suspended staging according to claim **3**, further including a suspension line for said staging, a drum on said staging onto which said line is wound to raise the staging and off from which the line is unwound to lower the staging, and variable speed motor means for rotating said drum, including a speed control, so that the drum speed and hence the staging travel rate can be adjusted and coordinated to the sweep speed of said holder means and the welding wire.

6. A suspended staging according to claim **3**, wherein said staging includes a seat for the workman spaced rearwardly of said swing arm assembly.

7. A suspended staging comprising a cage at least partially composed of interconnected tubular column frame members and tubular cross frame members, together forming a continuous fluid passageway extending through said tubular frame members;

heat generating welding apparatus on said staging including a welding tool component to be cooled in-

corporating a cooling fluid receiving chamber in heat exchange relationship with a heated zone from which heat is to be removed; and

means for circulating a cooling fluid through said tubular members, then through said component to be cooled, and then back through said tubular members, so that such members together function as an air cooled radiator for the cooling fluid as well as being structural parts of the cage.

8. A suspended staging according to claim 7, further including an inlet and an outlet for said radiator forming tubular frame members, and an inlet and an outlet for said cooling fluid chamber, and wherein said means for circulating the cooling fluid includes conduit means interconnected between the fluid outlet of said chamber and the fluid inlet of the radiator, and conduit means interconnected between the fluid outlet of the

9. A suspended staging according to claim 8, wherein said cage comprises spaced apart corner column frame members, laterally extending upper and lower cross frame members, and front-to-rear extending upper and lower cross frame members, all together forming a cage like working station, and means forming a floor for said working station, with at least some of said frame members being tubular and in fluid communication with each other to form a radiator having a substantial surface area exposure to ambient air.

10. A suspended staging according to claim 9, comprising electric welding equipment carried by said caging including a welding head constituting said component to be cooled.

* * * * *